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A Weekly Journal Devoted to Industrial and Engineering Chemistry

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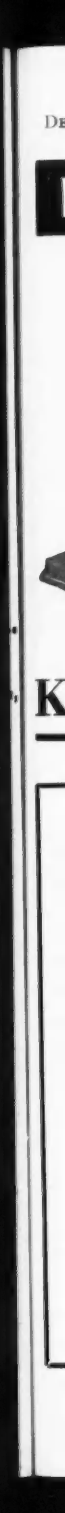

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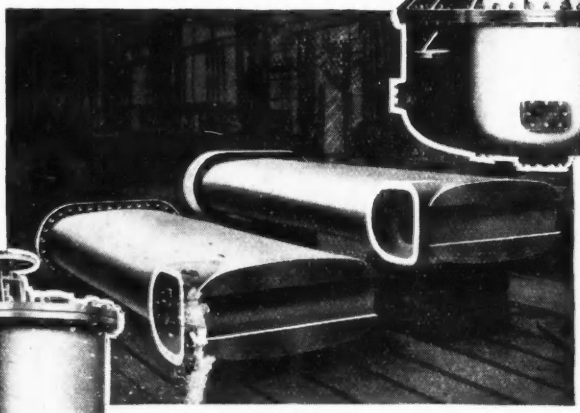

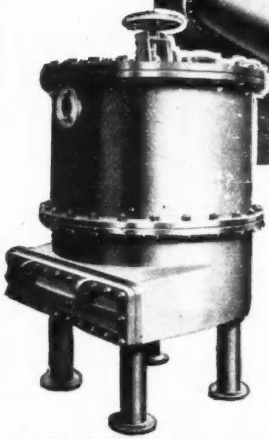

ILLUSTRATIONS.

TOP RIGHT. Jacketed Paddle Mixer.

CENTRE. Retorts in Heat-Resisting Cast Iron.

LOWER LEFT. Sulphur Burner.

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A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON — Telephone: CENTRAL 3212 (10 lines)
GLASGOW: 116 Hope Street (Central 3970) — BIRMINGHAM: Daimler House, Paradise Street (Midland 0784-5)

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The Scientific Work of the British Council

THE British Council is a storm centre around which a good deal of public controversy rages. On the one hand, there are these who regard its work as necessary and valuable; on the other hand, there are supporters of the extreme view that it does little or no good and is a waste of public funds. Those funds are pretty considerable: they amounted in the financial year 1944/45 to £2,336,140. The annual report for the year ending last March suggests a very broad approach, with a large volume of work all over the world. The Council's purpose is broadly to show and explain to other countries the special contribution which Britain and its people have made to the world's civilisation. We have frequently in these columns urged that more publicity should be given to our scientific and technical achievements, and it ill becomes us to cast stones at anyone who is attempting to do this. Nevertheless, it is our duty in pursuance of our aims to make constructive suggestions.

It is difficult to make an estimate of the need for the work of the Council in directions other than in science. There are departments dealing with such subjects as books, periodicals, films, music, and so forth. Our impression of much of this work is that it is highbrow in character and calculated to appeal mainly to those people in foreign countries who least need to have our contributions brought to their notice. There is something faintly distasteful to our mind in "pushing" British music abroad. If our composers are good enough, if their airs appeal to the ear of men and women of other nations, they will make their way. It did not require a German Council to make the names of Beethoven or Bach known the world over. No Norwegian Council introduced us to the music of Grieg. If Purcell, Elgar, Vaughan Williams and others do not find favour to-day with foreign audiences, neither will they do so though twenty British Councils arose to cry aloud their merits. There was no Elizabethan Council to push the claims of one William Shakespeare, but his fame has somehow become noised abroad.

Why should there be this effort to tell the world about our ways and about what we are doing? That is a question on which we should like to hear an authoritative reply. We do not ask this question in any carping spirit, but because upon the

On Other Pages

answer that is officially given to it depends the manner in which the work of the Council is carried on. Our considered view is that it is good that the British way of life should become more widely known the world over. Britain is often misunderstood; but she has won a warm regard from much of the world. From the U.S.A. there has been a stream of films, of books and of visitors—not a few of these latter in battle-dress. That has not been due to an American Council, but has been the normal march of events, for the most part normal commercial enterprise. The result is that we think we know the U.S.A. better than we know any European nation; better even than we know any other nation in the world. Some of our younger people even essay to speak her language. The result is, bluntly, that we find we like America. The Americans are people like ourselves and we feel at home with them. Thus the interchange of knowledge between nations makes for international goodwill and for mutual understanding.

If that is the goal of the British Council, does it achieve its aim? Does it go the right way about it? Let us say at once that we should agree that the translation of suitable books giving the right conception of life in these islands and putting the British case fairly and dispassionately would be a work well worth doing. Similarly, visits from British orchestras, British actors, the provision of British films suitable for the countries in which they are to be shown would be of immense value. Let us encourage other nations to come and see us; let us go to see them. But does the British Council make this sort of approach?

In the annual report we read of the export of teachers of English, of "brochures" in foreign languages, of personnel giving "voluntary art classes," of making British books available in foreign countries, of the distribution of more than 1000 periodicals, of the distribution of documentary films (films completed during the year included "Steel," "Plastics," "Optical Glass," and "English Village," in technicolour; with "Trade Unions," "A Farmer's Boy," and "The Man on the Beat"). The general impression left upon us is that of a good deal of valuable work, but much of it highbrow and of restricted value. An organisation which helped commercial enterprises to do these things for themselves, which promoted the commercial enterprises to do so, would be much more successful than one attempting to do many of these things as a Government-sponsored body.

We have dealt with the general background to some extent, because it forms a convenient starting-point from which to discuss briefly the work of the Science Department of the British Council. The Science Committee, headed by the President of the Royal Society, contains men of great eminence, but to our mind is overweighted on the academic side. In his foreword to a report just issued, Sir Henry Dale says: "It may be that the experience of war, the effect of which, in arousing attention to the significance of science, is now so widely apparent, was needed to suggest that the people of other countries ought to know something of what has been done for science and its application by British inventors, discoverers and teachers, if they were to obtain anything like a balanced appreciation of our nation's cultural contribution to the world. It seems clear that some organised effort was needed to enable the outside world to recognise the nature and dimensions of British contributions to the world's science. . . ." We knew that years ago!

The three main objectives of the science department of the British Council are: (1) To present and interpret the British contribution to science; (2) to provide information on all matters relating to science in Britain and its organisation in this country; and (3) to develop closer cultural relations between the scientists of all nations. Why do we want the rest of the world to be aware of the contribution this country has made, and is making, to the world's scientific knowledge and to its technical development? The answer appears to us to be simple; our answer may not be the British Council's answer, but it is this: If we let the foreigner know that we are a highly scientific nation, with an industry second to none, with scientists second to none, a nation right in the forefront of the world's scientific and technical progress, they will come to us

with their problems. They will listen with respect to what we have to tell them. *They will buy our products. They will use our brains.*

The work of the Council *assessed as directed to that end* strikes us as being good in parts. The monthly scientific comment, the Press material provided (we assume it is good material but we have never seen any of it), the supply of scientific books to foreign libraries, the lecture tours, and the provision of scientific information are all useful measures; everything depends upon how they are put into effect. We should have preferred to see more industrial men on the Council; more men with a sound knowledge of publicity. Whether films of "How Animals Develop," "Clocks and Watches," "Mechanical Movement" and "Engineering College" are going to help in the sale of British goods we do not know. We suspect the academic mind is behind this list.

Of very different calibre is the work of Dr. Needham in China. Here there is a branch office which is giving direct assistance and scientific help to the Chinese. This is the sort of work that the British Council should do, not only in China but in every country not already industrialised. The direct help through men on the spot who either have the information themselves or who can be readily provided with it from this country, is the surest way to encourage other countries to realise that we can and will make a contribution to their welfare. Let us have more of it. The future markets of the world must inevitably be in countries that have now a low standard of living. The very best way of helping ourselves and of helping the rest of the world would be to assist these countries directly towards a rising standard of living. The advice that might be provided through the British Council in the way that is being done in China could be an outstanding contribution to the welfare of the world.

Our view, for what it is worth, is that there is much of value in the work that the British Council is doing, but that it would be all the better for an overhaul by practical industrialists. We would not destroy nor reduce the "cultural" aspects of the Council's work, but we should endeavour to get better value for our money.

NOTES AND COMMENTS

Science and Reconstruction

THERE is no doubting the fact that Sir John Anderson, when he talks about the organisation of science, is well worth listening to. His address earlier this month, to the Manchester Joint Research Council, gave a really comprehensive view of the possibilities in that direction, and Mr. Hinchliffe, chairman of the Council, paid him a graceful compliment when he said that Sir John's presence in Manchester was the greatest encouragement that Council had yet received. Nevertheless, before getting down to his subject, Sir John modestly justified his presence on that platform by an introduction explaining his interest in, and his work for, British science. His main theme was that the building up of our industries, by scientific means, to a level of efficiency higher than any we have yet attained is essential to the maintenance of our pre-war standards and the restoration of our economic life. Discounting the tendency to decry our efforts in applied science, Sir John claimed that the two main reasons for our lagging behind in this field were the dead hand of tradition in our older industries, and the prejudice among scientists (especially in high academic circles) against putting their discoveries to any practical use. In our view this latter reason is tending to disappear; even academic scientists are beginning to realise that they cannot live on the products of pure reason.

Trained Personnel

IN considering what is now needed to make the most of our scientific resources, Sir John dealt with the problem under three heads: Personnel, Finance, and Organisation. Under the first head he recalled Sir Ernest Simon's report which made adverse comment on the numbers of trained scientific personnel turned out in this country as compared

with the U.S.A. The quality was no doubt all right, but the output has been far below our real needs. Teaching institutions *must* be enlarged, and the needs of industry must give way to some extent to those of the universities, as the Lord President suggested not long ago. An estimate of our requirements in this direction, both qualitative and quantitative should be drawn up forthwith.

The Financial Side

MEANTIME, research and development must be financed either by industrialists, in their own laboratories or through industrial research associations; by universities; or by Government, either through their own research establishments or through grants to associations, to universities, or to individuals. One great step already taken was the acceptance of the principle of a permanent grant to the D.S.I.R., and equally important was Sir John's own scheme, as regards universities, in taking capital expenditure into account when assessing Government grants. We should have liked to hear a suggestion for the foundation of something approaching the Mellon Research Institute, where different groups of industrialists combine to award Fellowships with the aim of furthering some specific type of applied research. Due reference was made to the system by which industrial research expenditure is taken into account in making deductions before assessing income tax on individual undertakings. Sir John asserted that there was little doubt that the expenditure directly incurred by Government for research purposes would "increase substantially"; we are not yet quite convinced, however, that the cheeseparing policy of the Treasury has been finally abandoned.

Organisation for the Future

ON the all-important problem of organisation, Sir John had quite a few words to say. His six main suggestions cover (i) standards of remuneration, (ii) conditions of service with uniform pensions, (iii) free exchange of ideas, (iv) applied research in teaching institutions, (v) fundamental research in industrial research establishments—the corollary of (iv) —, and (vi) the appointment of committees to co-ordinate the work of industrial and academic research establishments, in order to abolish wasteful overlapping. Though rejecting the idea of appointing a "Minister of Science," he advocated certain changes in the functions of the Lord President, who is directly responsible for the general scientific activities of the Government. While maintaining this general responsibility, he would advocate the continuance, on a peacetime footing, of the war-time Scientific Advisory Council as the principal adviser of the Lord President; and he would create a special scientific section of the Cabinet Secretariat to assist the Lord President. It will be seen that there is nothing in any way revolutionary or utopian in any of these suggestions; and as we remarked last week, the House of Commons seems determined that something shall be done. No doubt this pronouncement of so distinguished a statesman as Sir John Anderson has not gone unnoticed even in the Government camp.

New Control Orders

Release of Mica

THE Control of Mica (No. 5) (Revocation) Order, 1945 (S. R. & O. 1945, No. 1489), which came into force on December 1, revokes the Control of Mica (Nos. 3 and 4) Orders, 1944-5, under which the acquisition, treatment, use and consumption of certain categories of mica in excess of an aggregate worth of £5 in any one calendar month are subject to licence. Licences will no longer be required for the acquisition, treatment, use or consumption of any categories of mica. Inquiries should be addressed to the Mica Control, Euston House, Eversholt Street, London, N.W.1.

Iron and Steel Order

Under the Control of Iron and Steel (No. 45) Order, 1945 (S. R. & O. 1945, No. 1502), which came into force on December 12, the following materials may now be acquired without licence: (1) Ferro alloys (other than spielgeleisen and ferro-manganese smelted in a blast furnace); (2) calcium silicide; (3) tungsten metal powder; tungsten metal sintered lamps; tungsten metal scrap; (4) titanium carbide; (5) cemented carbide hard metal; (6) molybdenum metal powder; molybdenum metal scrap; (7) any chemical compound of molybdenum or tungsten or vanadium.

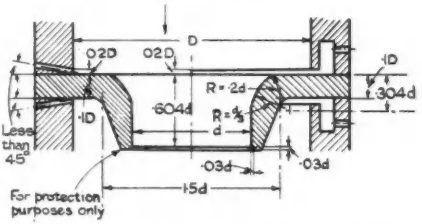
Measurement of Steam Flow*

Suitable Instruments Aid Economy

by T. F. HURLEY, O.B.E., B.Sc., A.C.G.I., A.M.Inst.C.E.†

THE present shortage and high cost of fuel and the widespread publicity which has been given during the war to methods of reducing fuel consumption make it unnecessary to stress the benefit to be derived from the use of suitable instruments in the boiler house and in the factory. It is generally accepted that without them the management cannot know whether a plant is being run efficiently, or how its performance compares with that of similar plant. The operator uses them to detect and measure variations in operations, to ascertain the cause of any changes, and to rectify faults.

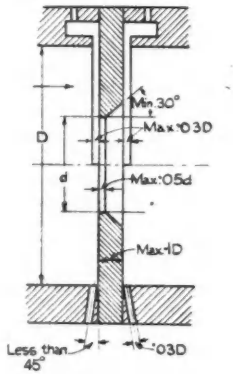
At the same time merely installing instruments, no matter how well made or how expensive they may happen to be, does not by itself increase efficiency. If they are not correctly fitted and properly maintained they become either a source of worry and confusion or else so much more or less ornamental but useless junk. This is particularly true of the steam meter. It is not a difficult or a complicated matter to instal a steam meter correctly or to maintain it in good working order, but, on the other hand, it is also quite easy to fit a well-made and properly designed instrument in such a way that it will give completely wrong readings while apparently working perfectly. The aim of the present paper is to explain some of the snags and to show how they can be avoided.



Left half shows construction for corner tappings. Right half construction for annular tappings.

If desired the annular tappings may be made integral with the nozzle assembly.

Fig. 1. Standard nozzle.



Upper half shows construction with annular tappings. Lower half shows construction with tappings into pipe flange.

Fig. 2. Orifice plate with corner tappings.

Steam flow can be measured in many ways, the best of which depends upon the pressure drop that occurs when the steam flows through an orifice. Most commercial meters use this method and their construction and operation are based on the assumption that the weight of steam flowing through an orifice is proportional to the square root of the pressure drop, *i.e.*, $Q = k\sqrt{h}$, where Q = weight of steam per hour, k = a constant, and h = the pressure drop. No other variables are taken into account by the usual mechanism.

The necessary equipment consists of three parts: (1) an orifice fitted in the steam line, (2) an instrument indicating differential pressure, and (3) the pressure leads connecting the instrument to the steam line on either side of the orifice. Two types of orifice are in general use, the shaped

* From an article in *Fuel Economy Review*, 1945, **24**, 53.
† Principal Scientific Officer, Fuel Research Station, Department of Scientific and Industrial Research.

nozzle, and the sharp square-edged orifice, both of which have been standardised by the B.S.I. in the designs shown in Figs. 1 and 2 respectively. It will be noticed that with either type a geometrically similar design is used, whatever the size of the pipe into which the orifice is introduced.

The instrument may, and in practice does, take many forms, as might be expected from the fact that any device capable of standing the mains pressure and indicating a differential pressure may be used. In its simplest form it consists merely of a mercury-filled U-tube, and much useful and reliable information can be obtained with a "home-made" indicator of this type. Realising this, the Fuel Efficiency Committee of the Ministry of Fuel and Power has sponsored a cheap but efficient indicator which can be built up from simple castings and which shows pressure drop (and hence steam flow) by the height of a column of mercury in a gauge glass.‡

Commercial instruments are usually far more elaborate and incorporate a mechanism enabling the flow to be read more easily by means of a pointer moving over a scale, and in some the readings are recorded on a time chart. They also have zero adjustments and safety devices which guard against excessive pressure differences across

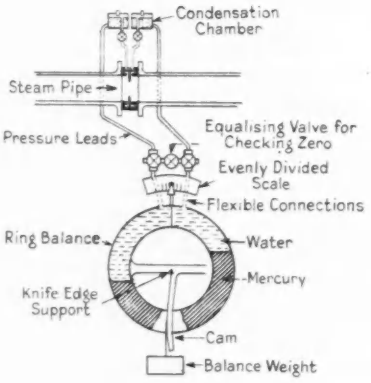


Fig. 3. Ring Balance.

the instrument in either direction. One type consists essentially of a mercury U-tube in which the mechanism is actuated by a metal float, while others employ some form of controlled diaphragm which may be a single reinforced rubber disc or a multiple bellows arrangement similar to that used in an aneroid barometer.

With these instruments, since the rate of flow is proportional to the square root of the pressure drop, the steam flow scale is very constricted for the lower loads; for example, at one-tenth full load the differential pressure and the movement of the pointer is only one-hundredth that at full load. This increases the difficulty of reading the instrument and of calculating the total flow in a given time from a recorder chart.

In the ingenious ring balance type shown diagrammatically in Fig. 3 the differential pressure is arranged to set up a torque which is balanced by a weight so suspended that the angular rotation of the ring is proportional to the square root of the differential pressure. This means in practice that the scale is evenly divided, *i.e.*, the pointer moves an equal distance for equal increases in the rate of flow. The same advantage can be obtained with electrically-operated instruments.

Apart from any question of scale the small differential pressure available to operate the instrument at low loads means that a small constant error in construction or operation may become increasingly important as the load is reduced. A steam meter should therefore not be operated at less than, say, one-third of its full load if a high degree of accuracy is required. The same instrument can be made to work on a different scale by using a more suitable orifice diameter.

Easy Check on Accuracy

It is not always realised that, as the instrument part of a steam meter is merely a "glorified U-tube," it is comparatively easy to check its accuracy. If the pressure leads are replaced by two vertical glass tubes which can be filled with water to different levels, the movement of the pointer can be compared with the head of water necessary to produce that movement. A full-scale deflection should correspond to the makers' design figure (usually of the order of 40 to 60 in. of water) and if the intermediate readings then give a straight line through the origin when the square root of the differential head is plotted against flow reading, the instrument itself is in good order.

The connections between the instrument and the steam main are usually made with small-bore copper pipe and are filled with water. As any difference in the head of water in the two leads will affect the differential pressure across the instrument, it is essential that both pipes should be completely filled, that they should be at the same temperature, and that they should be free from air locks.

In order to maintain the pipes full up to the level of the orifice tapping it is usual to provide cooling towers or condensation chambers, of which alternative types, fitted

‡ *Fuel Efficiency Bulletin* No. 6.

to horizontal and vertical mains respectively, are shown diagrammatically in Figs. 4 and 5. In commercial units the cooling towers are often integral with a special orifice carrier, thus ensuring a correct assembly of the orifice, cooling towers and pressure leads.

It will be realised that the condensation chambers provide a reservoir of water, which is automatically made up, when necessary, by condensed steam, to compensate for the pumping action which takes place due to the movement of parts of the instrument when the load fluctuates. They should be large enough to ensure that the water level does not fall below either orifice tapping, and when they are fitted to a vertical pipe (Fig. 5) the steam connection should be lagged and large enough for any condensate to drain into the main without being trapped.

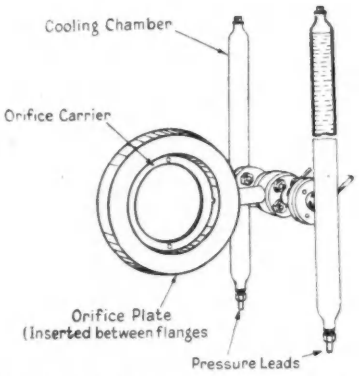


Fig. 4. Cooling towers for horizontal steam main.

If the pressure leads become warm to the touch either the cooling chambers are not large enough or, more probably, there is a leak in the system. Even a slight leak will affect the differential pressure at the meter and should be eliminated. To avoid air locks the leads should everywhere have a "fall" of at least one in twenty, and vents, which should be opened periodically, should be provided wherever air locks are liable to occur.

A detailed mathematical analysis of the factors affecting the flow of steam through orifices is given in "The Commercial Metering of Air Gas and Steam,"* by J. L. Hodgson, and in B.S. Code 1042/1943: "Flow Measurement." Both publications give ample data on which to design and to instal orifices, and the reader who makes his own orifices is advised to study either or both. The analysis shows that the equation $Q = k\sqrt{h}$ is true only under certain specified conditions. These conditions can usually be met without difficulty, but if they are not the meter may give a correct differential-pressure reading but a wrong steam-flow reading. Thus the relation does not hold for a pulsating flow and an orifice type meter should therefore never be used

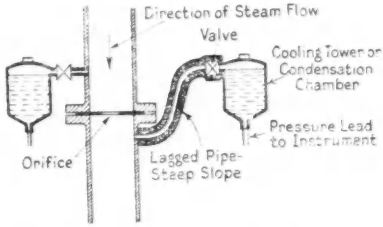


Fig. 5. Cooling towers for vertical steam main.

close to a reciprocating steam engine. It may give a steady reading, but it will be a false reading.

Similarly, the equation should, strictly speaking, contain a term involving density, which is ignored in its application to commercial meters. The meter will therefore read incorrectly if the steam pressure and the superheat temperature, or in the case of wet steam, the dryness factor, differ from those for which the meter was designed. In such cases a correction factor must be applied to suit the modified equation, $Q = k\sqrt{h\frac{w_1}{w_2}}$, where w_1 and w_2 are the weight of a cubic foot of steam under the actual and the design conditions respectively.

Some makers will supply an attachment which automatically corrects for pressure, but with dry saturated or superheated steam it is not difficult to make readings enabling a correction factor to be calculated from the steam tables. The correction should obviously be applied to several individual points and not averaged over a whole chart. In the case of wet steam, obtaining the dryness factor often presents difficulties, but for some purposes it may be sufficiently accurate to instal a steam separator at a suitable point before the meter and assume a constant dryness factor.

The equation also assumes that the steam flow is evenly distributed over the cross section of the pipes leading to and from the orifice and across the orifice itself. This gives rise to serious errors if the flow is upset by the presence of obstructions, such

* *Proc. Inst. C.E.* 1916-17, *230*, Part 2.

as valves, bends or elbows, near the orifice. The makers therefore usually recommend having at least 12 pipe diameters of straight pipe before the orifice and at least 6 pipe diameters after the orifice. The actual safe figure will depend upon the type of obstruction and those given should be exceeded whenever practicable, particularly on the upstream side; for example, the B.S. code goes so far as to suggest that a length of 100 diameters of straight pipe is desirable when it is necessary to fit a globe regulating valve before the orifice. In the same way the pipework near the orifice should be reasonably smooth, *i.e.*, free from scale, deposits, etc., and truly circular, care being taken to ensure that the orifice itself is located centrally in the pipe. If this is not done the pressure distribution round the orifice will be uneven and the differential pressure readings may be affected.

Annular pressure tappings (*see* Figs. 1, 2) are sometimes preferred as they tend to average out irregularities in pressure distribution round the circumference of the orifice, but with reasonable care in fitting, a single hole tapping will be satisfactory. If single hole tappings are used the hole should be small and the ends of the leads flush with the interior of the pipe, as they will otherwise upset the flow and so cause local pressure variations which affect the differential pressure.

Details of Design

As might be expected, the constant k in the equation $Q = k\sqrt{h}$ is greatly affected by the shape and dimensions of the orifice. The influence of orifice diameter is, of course, obvious, but other details, such as, for example, the shape of the leading edge, are of real importance. It is essential, therefore, that the orifice should conform precisely to a well known and tested design, such as those given in B.S. 1042, for which all the necessary data are accurately known. The design must also meet certain other conditions: for example, the ratio of the diameter of the orifice to that of the pipe should not exceed 0.7, the differential pressure should be small compared with the full steam pressure, and a correction should be applied if, as may be convenient, the pressure tappings are not flush with the faces of the orifice. The designer usually has little trouble in meeting these conditions in the case of steam-flow measurements.

On the practical side it cannot be too strongly stressed that a small variation in the shape of an orifice may have a large effect on its accuracy, especially with the usual plate type. The orifice plate should, therefore, be strong enough mechanically to avoid warping or distortion of any kind and it should be made of metal which is not affected by corrosion or erosion. It is particularly important that the edge of the orifice should be truly square and really sharp: the smallest rounding of the edge or the presence of the slightest burr will alter the constant. The orifice plate should therefore be accurately made in the first place, and when in service it should be periodically examined and replaced if the least damage can be detected. At all stages it should be handled with the utmost care.

The emphasis which has been placed throughout this article on the need for special care in the installation and maintenance of steam meters may possibly tend to give a wrong impression of their utility, but consideration will show that fundamentally the precautions mentioned are simple and easily taken.

In practice steam meters are usually robust and they are not temperamental by nature. When correctly installed they should give readings accurate to within ± 2 per cent., or better, over long periods without much attention. This accuracy is not equal to that sometimes obtained during boiler trials by weighing the feed water or by using suitably calibrated measuring tanks, but for continuous working the steam meter is far more convenient. It is also, in the opinion of many users, more accurate than its rival the water meter. For process work it is usually the only practicable method of measuring steam consumption and it is then indispensable to a well-run works.

NOTE.—Figs. 1, 2, and 5 (slightly modified) and Fig. 4 are reproduced by permission from the publications of the British Standards Institution, and George Kent, Ltd., respectively.

ACTIVATION OF CATALYSTS

It was found by J. A. Hedvall and G. A. Ahlgren (*Kolloid Z.*, 1942, *100*, 137) that as a result of irradiation of nickel powder with the electromagnetic waves from a radio transmitter, or from a spark gap inductor, the activity of the nickel contact showed an increase. The catalytic dissociation of nitrous oxide was about 14-38 per cent. higher with the radiated nickel powder than with one which had not been treated. The effect of the increased catalytic activity of the radiated powder was ascribed to the fact that between the individual particles of the powder, minute fritted bridges were formed (cohesion effect). This makes possible the formation of an unstable structure and of active nuclei at the catalyst surface, which, as a result, gives a higher activity. This effect of increasing the reactivity of a catalytic surface may be repeated several times on the same powder by further subsequent irradiation.

I.C.I.'s Tees-Side Project

Chemicals from Coal or Oil

THE greatest single post-war industrial project so far announced by British industry is I.C.I.'s plan for the production on the Tees, of heavy organic chemicals from oil or coal. The capital expenditure involved over a period of five years is estimated at about £10,000,000, to be spent on the construction of installations for the production not only of heavy organic chemicals based on oil or on coal from the near-by Durham coalfields, but also on the erection of a plant for the production of sulphuric acid, an electrolytic chlorine caustic soda plant, and a vacuum salt plant. This industrial agglomeration, which will fill a noticeable gap in the present structure of Britain's chemical industry, is to be located on the Wilton Estate, extending over an area of over five square miles, three miles east of Middlesbrough.

Modern Lay-Out

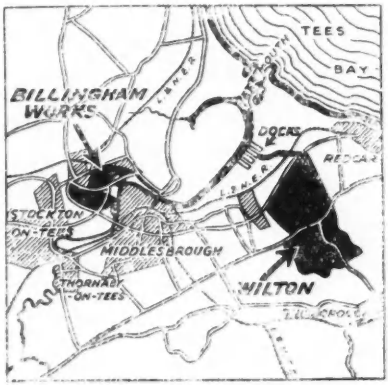
It is intended to employ the latest advances in research and the most modern knowledge of industrial planning, technical requirements, housing for workers, and recreational amenities. In order to ensure that the works in particular, and the estate as a whole, are laid out to the best advantage, the company has engaged Mr. G. A. Jellicoe, President of the Institute of Landscape Architects.

This great project was initiated as long ago as April, 1944, with the knowledge and approval of the Government. It lies in a development area to which the Government is eager to attract new industries. The new plants should make a great contribution to the prosperity of Tees-side, and particularly of the people of Middlesbrough, Stockton, Redcar, Saltburn, Guisborough, and of the towns and villages of the Cleveland Hills, from which much of the labour will be drawn. When completed the project is to give employment to over 10,000 persons, while a labour force of about 3000 will be employed on construction and development.

Access to Salt

In selecting a site for a scheme of this nature, difficult problems of industrial location had to be solved. In the first place, it was desirable to find one which lay in a development area, in order to make the most effective contribution to post-war employment, and, secondly, it was essential that the site should have the maximum of industrial advantages, including easy access to a supply of salt.

The Wilton estate fully meets these desiderata. Ample salt is available, and adequate quantities of coal will be obtained from the Durham coalfield. The large amount of cooling water necessary will be available from the Tees estuary, and the Tees Conservancy contemplates the establishment of deep-water docks little more than a mile away, thus facilitating the entry of oil and the shipment of manufactured products. Road and rail access is also available. The site, as shown on the map, has



a frontage of 3250 yards on a trunk road on its northern side; on the south side there is another main road, which provides a route for long-distance traffic going to the south and west without passing through Middlesbrough or any other urban centre. On the north side, there will be rail connections to the L.N.E.R., and to the deep-water docks.

The scheme has been discussed in detail with the local authorities concerned, the railway company, the Tees Conservancy Board and every interest whose active co-operation and assistance will be essential.

The Wilton estate falls geographically into two parts, each of approximately 1800 acres, with Wilton Castle in the centre. The actual industrial development will be confined to the northern half. The southern half, which consists in about equal measure of farmland and woods or parkland, will form an admirable site for the housing of staff and workpeople. Part of the parkland will be converted into playing fields, with a recreation club and pavilion attached. It is the intention of I.C.I. to create on the Wilton site an industrial enterprise on the most modern and efficient lines, which in layout, appearance, and social amenities for all employees will compare favourably with any to be found elsewhere.

A Note on Corrosion

Effect on Sectional Hot-Water Boilers

by W. PERCIVAL and J. J. AGGIO

THE general opinion of those engaged in the manufacture, maintenance and insurance of cast-iron sectional hot-water boilers, under reasonable working conditions, suggest a useful life of about 15 years. This figure can be regarded as a very conservative one, and there are many instances of boilers of 40 years of age and more which are still in use to-day. However, as a basis for comparison 15 years can be used; certainly most users would not expect less.

In the last few years, and particularly where direct coal firing has been introduced, frequent cases of excessive external corrosion of the sections have been observed in the Leicestershire district. Sections have fractured, and it has been assumed that expansion and contraction were the cause. A case can be quoted where a unit installed in 1940 was condemned as useless in 1944, owing to the thinning of the sections to 1/16 in., entirely because of external corrosion of the elements. Other instances are known where renewal of sections was necessary after the comparatively short life of seven years. Chemical examination of the scales found in the flues of these boilers showed them to consist mainly of ferric and ferrous oxides and hydroxides and free sulphur, along with smaller amounts of carbonaceous and siliceous matter, and ferrous and ferric chlorides.

Accumulation of Moisture

A surprising feature was that after the boilers had been cleaned and scaled internally, and the doors of the furnaces removed in the usual way to encourage drying by air currents, beads of moisture developed and continued to increase until areas of the elements were covered with this damp film. It was particularly noted that portions of the furnace subjected to the maximum heat were mainly free from this damping action, and that those parts where gas flow would be expected to be least had the greatest amount of film, progressively increasing to the chimney entrance as the products of combustion would yield their heat to the sections.

Analysis of this damp film showed it to consist mainly of water along with ferrous and ferric chlorides. These salts are hygroscopic and acidic in reaction, and account for the production of the damp film previously noted. No normal drying is possible until they are chemically neutralised.

A washing test was carried out on a number of samples of powdered flue scales, and this gave some useful information on the mechanism of the reactions taking place in a standing boiler with scales still in position. The filtered distilled water contained a large amount of iron in solution, and was acidic in reaction, sulphates and chlorides being present in large amount.

It may be noted at this juncture that free sulphur, with iron oxides, air, and moisture, develops sulphuric acid which would create circumstances materially contributing to the general causes of boiler corrosion; and all these factors are present in the instance in hand. Examination of the boiler fuel also showed that free chloride as sodium chloride was present in appreciable amount.

From a consideration of the above, it would appear that chlorides are a highly objectionable impurity in any fuel to be used where the flue temperatures can fall below the dissociation or condensation temperatures of the salts of iron that would be produced by any chemical action of the halogen acid present in the products of combustion upon the boiler shell.

Compared with a hot-water heating boiler, a steam boiler has higher flue temperatures, and does not usually operate under such static conditions; and observation and examination of a large number of steam installations has so far shown no occurrence of this chloride attrition.

In summarising the points noted, one must conclude that the mechanical stoker operating with raw fuel containing chlorides materially contributes to a very short life when used along with cast-iron heating boilers. Conversely, the steam boiler under similar conditions is a much more satisfactory proposition.

From a chemical point of view it would appear that coke and anthracite are more suitable fuels for cast-iron sectional heating boilers when viewed from certain angles, particularly when the life of a boiler is a factor; and the convenience of mechanical stoking with slack, etc., must be carefully considered in areas where salt is present in the fuel, as frequent renewal of boiler sections, with consequent high cost and inconvenience, may be anticipated.

The nationalisation of the French petroleum industry is proposed by the National Federation of Chemical Workers, which demanded the exclusion of private capital by the creation of two nationalised companies, the nationalisation of all oil imports, and the linking-up of the most important plants in the country by State-owned pipelines.

Chemicals from Coal in the North

Coal-Processing Industries' Report

TWO reports* have just been published by the Coal Processing Industries Panel of the Northern Industrial Group. These were originally submitted last July to Mr Oliver Lyttelton, then President of the Board of Trade, and they are preceded by a letter to him from Viscount Ridley, chairman of the Northern Industrial Group. In this the chairman points out the aims of the Group, including the extension of facilities for the supply of unpurified gas to gas-works, and the integration of the supply of purified gas by means of a gas grid; also the establishment of an integrated section of the chemical industry, based on the processing of crude products which so far have been exported from the North-East, either in their crude form or as coal.

It is the second of these objectives which will be of particular concern to readers of THE CHEMICAL AGE, and it is interesting to note that the suggested integration is proposed to be based on (a) an indication of the official view on the development of the tar-distillation industry, and (b) official financial support for the process of ethylene extraction from coke-oven gas. The advantages of the N.E. district for any development of the Fischer-Tropsch oil-from-coal process are also considered.

Some extracts from the reports of the Panel are appended. The members of the Panel, representative of all the principal branches of the coal-processing industries in the counties of Northumberland and Durham, were Messrs. H. L. Riley (chairman), E. W. Muddiman (secretary), J. Brown, C. Cockram, A. Crawford, F. Crowther, E. M. Myers, G. M. Nave, and W. A. Walmsley. Throughout their deliberations they had the benefit of the advice of Dr. J. H. Jones, of the Newcastle Coal Survey Laboratory, D.S.I.R.

The Tar-Distillation Industry

Dealing with the possible extension of the tar-distillation industry, the report notes that the figure for total personnel employed in the North-East by the tar-distilling undertakings is very small, and even if the present tar output were doubled there would be little increase in labour requirements for handling the larger throughput. There does, however, appear to be a strong case for the maximum possible extension of manufacture of refined products from tar in the area, such as, for example, pure phenol and the specialised grades of phenols required by the synthetic resin industry. Since 1938, several plants have been producing synthetic resins of all types locally.

Several handicaps, however, prevent the working-up of some of the pure coal-tar products which are needed for plastics and for other manufactures in the North-East. For instance, in their content of phenol and cresols, and indeed in all the lower-boiling coal-tar fractions, most Durham tars are very poor when compared with other tars such as those from high-volatile Yorkshire coals. Durham tars yield only about one-third of the total tar acids which are obtained from Yorkshire tars, and, apart from the extra cost involved in washing larger quantities of oil, individual distillers do not produce sufficient quantities of acids to warrant the installation of costly refining plants.

Phthalic Anhydride Production

High yields of naphthalene are obtained from Durham tars, and the relatively pure hot-pressed product is made at a number of works in the area, much of it going outside for phthalic anhydride production. Some criticism has been advanced that local naphthalene producers do not make their own phthalic anhydride, but the position is complicated by patent rights and production agreements and, unless the process is installed in this area by one of the companies at present manufacturing phthalic anhydride elsewhere in this country, no prospect of establishing this extremely promising industry seems likely to mature.

Another disadvantage under which the local tar industry operates is in its multiplicity of small units, and these units therefore do not produce any given coal-tar product of prime importance to the chemical industry in sufficient quantity to enable them to put down a refining plant of economic size. The solution to this problem would appear to lie in larger distillation units, or the setting up of a central refining plant in a suitable place or places.

Large quantities of anthracene oils are produced by the North-East tar distillers, and, in the opinion of the Panel, there is much scope for intensive research into the chemical nature of the higher-boiling tar hydrocarbons and of pitch itself, since the latter represents 55 per cent. to 65 per cent. of coal tar. It is only by the application of the results of such research—and here there is a promisingly fruitful field—that new developments can be expected.

Calcium Carbide

Calcium carbide made from coke and lime has become in recent years an extremely

* Obtainable (price 6d.) from the Northern Industrial Group's office, 9, Eldon Square, Newcastle-on-Tyne, 1.

important material for the commercial production of acetylene, which is now the raw material for a large number of organic compounds, notably butadiene and many types of synthetic rubbers such as Buna S. The Panel has discussed the problem of carbide production, and is of the opinion that if made from coal-produced power here it would require heavy financial subsidy. There are no water-power resources of any magnitude in this locality, and one of the primary requirements for the calcium carbide process is very cheap and adjacent power in large quantities. Carbide production involves the use of the electric arc with a power consumption of about 3500 kWh per ton of carbide made. If we wish to make organic chemical products from coal through carbide conversion, the project will need financing on a large scale to carry through to completion units of a size capable of supplying this country's requirements.

In a short report such as this it is impossible to discuss as requested so wide a range of processes as would be covered under the heading "Chemical industries based on processing raw coal." The Panel therefore confine their remarks to the main branches of chemical industry which might be developed from their recommendation for the extraction of ethylene from coke-oven gas. This may appear to be dealing with only one aspect of the problem of developing a chemical industry with coal as the primary raw material but, nevertheless, in the case of ethylene they would be processing a coal by-product which is immediately available now, and one which is so reactive and capable of so many chemical transformations that a wide variety of organic chemicals and plastics can be built up from it.

The quantities of ethylene at present used in this country for commercial operation are small when compared with those processed in the U.S.A., Russia, and Germany. The gas is made here either by the cracking of petroleum oils or from ethyl alcohol produced by fermentation of molasses, and little ethylene is extracted from coke-oven gas for commercial purposes. The percentage of ethylene, and probably of propylene, in coke-oven gas varies, and depends on such factors as the type of coal carbonised, temperature of carbonisation, and design of coke-oven installation, but it is usually about 2.1 per cent. of ethylene and some 0.2 per cent.-0.3 per cent. of propylene. Thus, in 1000 million cu. ft. of coke-oven gas, a quantity which is normally available as surplus gas annually from a coke-oven battery of average size, there are about 700 to 800 tons of olefines available for extraction. This would be material sufficient for the operation of a large-scale pilot plant

It has been a difficult matter to arrive at figures showing the current values in this country of ethylene and chemical products made therefrom. Much more information is available from journals of American origin, and this itself is additional evidence, if it were needed, of the unsatisfactory state of this branch of the organic chemical industry here. The following figures give some idea of present-day values of ethylene and its derivatives.

Ethylene from Alcohol

For every 5 tons of cane sugar made, about 1 ton of molasses (the uncrystallisable residue) is obtained. This molasses contains some 50 per cent. of sugar and a satisfactory content of the mineral salts required by yeast, and practically the whole of the alcohol produced in recent years for industrial purposes or fuel has been derived from molasses. The selling price of alcohol is about £26 per ton, but with the tax rebate the cost to the user is £16.6 per ton.

Most of the ethylene produced in this country is made from alcohol. Assuming a conversion efficiency from alcohol to ethylene of 90 per cent., 1.83 tons of alcohol are required for 1 ton of ethylene. The minimum cost of this ethylene will be £30 per ton and processing charges will vary from £5 to £10 per ton of ethylene according to scale of operations.

Ethylene from Petroleum

The ethylene required for the manufacture of polythene is probably produced from petroleum by cracking, but we have no data for costs of production. The prices of the chemicals mentioned below are therefore taken from American sources. It is clear from the literature that they are based on ethylene from petroleum products at about £33 per ton. Dr. W. D. Scott, in a recent paper, states that the estimated post-war cost of alcohol synthesised from ethylene will be 15 cents per U.S. gallon, or £12.7 per ton, so that this suggests a maximum price for ethylene of $12.7 \times 1.83 = £23$ per ton. Figures published by the Office of the U.S. Rubber Director give a post-war figure for ethylene of £11 to £16.5 per ton. It is apparent, therefore, that ethylene manufactured from coke-oven gas will have to compete with ethylene from petroleum sources at something around £15-£20 per ton.

Ethylene from Coke-Oven Gas

No figures are available for the cost of production of ethylene from coke-oven gas by the liquefaction process, as only one plant may be operating in this country. A selling price of £20 per ton of ethylene is equivalent to 13s. 4d. per 1000 cu. ft.

Assuming the installation of a plant to operate the liquefaction process for recovering ethylene from the "return" gas

for a battery of coke ovens, with an ethylene content in the gas of 2 per cent., a charge of 2d. per 1000 cu. ft. of coke-oven gas sent to the compressors would, to the owners of the ethylene extraction plant, be equivalent to a buying price of 8s. 4d. per 1000 cu. ft. of ethylene. This would leave only a sum of 5s. per 100 cu. ft. of ethylene made to cover all compression and operating costs, capital charges, interest and depreciation, etc., which would probably not be sufficient except with very large extraction units. The return gas would have its calorific value reduced by about 40 B.Th.U. per cu. ft. because of the extraction of olefines, but this reduction would not greatly affect the heating of the ovens, except for a small increase (about 8 per cent.) in the volume of return gas required. Many developments would immediately follow from the installation of such plant. Further separation of the constituents could be carried out, and compressed hydrogen, methane and carbon monoxide made available for industry or for production of a wider range of organic compounds.

Some Practical Suggestions

The question will probably be asked as to the best way in which these and the following suggestions can be implemented and a start made with laying down the first installations. This is, perhaps, outside the terms of reference of the Panel, but they indicate ways whereby something could be accomplished without further delay. The fact that at least one ethylene extraction scheme is being promoted locally is an indication of the possibilities which lie ahead.

There has lately been the promise of a substantial increase in State contributions to research in this country, and an allocation from this source could be applied to the development of ethylene extraction and its conversion to organic compounds such as are described below.

Progress might also be made in erecting ethylene extraction plant by utilising, if the new Distribution of Industry Bill becomes law, the powers recently asked for by the Board of Trade in the directing of industry to the Development Areas and in giving financial aid to help in establishing new industries. There is little doubt that some coke-oven undertakings in Durham would be willing to provide facilities for these liquefaction plant trials, either on their return gas or their surplus gas, provided that the companies concerned were indemnified against financial loss in so doing. Developments, on the lines of this report, are included in the programmes of the Standing Consultative Conference on Fuel Research, but they are important enough to warrant joint action by industry and the Government with financial assistance from the latter.

A new method of extraction of ethylene and propylene from coke-oven gas has recently been worked out in America. It is based on a process operating on a commercial scale in the U.S.A. for removing the C_3 and C_4 hydrocarbons from oil-refinery or oilfield gases, and it is claimed to be even more efficient for ethylene extraction when working on the lower concentration of the olefines in coke-oven gas. The principle of the new process is countercurrent contact between a moving bed of activated charcoal and the gas stream, whereby the ethylene is absorbed. Practically no moving parts are required to circulate the charcoal within the hypersorption unit, and the ethylene is continuously removed by steam in a closed cycle, operating at 10 lb./sq. in.

In the opinion of the Panel, this new method of separating ethylene from coke-oven gas is very promising and should be considered along with the liquefaction process in any project which materialises. Costs of the plant in America show that a hypersorption plant installation treating 4 million cu. ft. *per diem* of refinery gases with components ranging from hydrogen to naphthalene (and containing about 9 per cent. of C_3 hydrocarbons and 3.5 per cent. of C_4 hydrocarbons) will produce the C_3 and C_4 products at a processing cost of 4.24 cents per U.S. gallon in a plant costing 320,000 dollars.

Both Reports embody the statement that the North-East provides one of the most suitable areas in the country for large-scale trials of the Fischer-Tropsch process. The County of Durham, with its large coke-producing units and potential reservoirs of surplus gas, is eminently well placed for this research work and the products made by the Fischer-Tropsch process may be linked with those from the ethylene extraction scheme.

Organic Chemicals from Ethylene

Ethylene is an unsaturated hydrocarbon gas which is very reactive and can be converted by physical and chemical means into many different compounds. A few of the more important are mentioned in the Reports.

1.—*Polythene.*—Polythene, or polyethylene, is a crystalline flexible wax-like solid, melting at 110°C. It is made in this country under patents controlled by I.C.I., Ltd., by polymerising ethylene in special compressors at very high pressures—about 1500 atmospheres and above. It is the simplest synthetic thermoplastic and has the excellent electrical properties associated with hydrocarbons—low dielectric constant, low power loss, and small water absorption and permeability.

2.—*Ethylene glycol.*—This liquid is made from ethylene by oxidation processes, or from ethylene dichloride by the action of dilute aqueous alkalis. It is used as an anti-

freeze liquid and as a starting material for many other ethylene compounds, such as chlorhydrin and monomethyl ether (methyl cellosolve). The American price for tank-car lots was £80 per ton in 1942 and £50 per ton in 1944.

3.—*Ethylene dichloride* is an oily liquid made from ethylene and chlorine. It can be converted to glycol and other ethylene derivatives fairly easily. The U.S. price of ethylene dichloride in 50-gallon drums was £55 per ton in 1939, and £44 per ton in 1942-44. Thiokol A, a rubber substitute, used as a non-insulating flexible jacket material in the cable industry, is made from ethylene dichloride and sodium tetrasulphide.

4.—*Ethylene chlorhydrin* is a colourless liquid which is a valuable intermediate product in the manufacture of "synthetic" rubbers. It is made by the action of hypochlorous acid on ethylene or from ethylene glycol and hydrochloric acid. It is not sold in this country and is used only as an intermediate. In 1939 the price quoted on the American market for 40 per cent. chlorhydrin in carboys was £415 to £470 per ton chlorhydrin.

5.—*Ethyl chloride*, also made indirectly from hydrochloric acid and ethylene, is a colourless volatile liquid of considerable importance in the dyestuffs and organic chemical industry. In 50-gallon drums the U.S. price in 1942-44 was £100 per ton.

6.—*Glycol monomethyl ether*, or methyl cellosolve, is an organic solvent widely used in a number of industries. It is made from ethylene chlorhydrin and methyl alcohol, and its price in tank-car lots in the U.S.A. was £86 per ton in 1942, and £75 per ton in 1944.

Possibilities for Styrene

7.—*Styrene*, or phenylethylene, is an organic liquid which has been manufactured for some time abroad for use in the plastics industry. The most common method for its production is by catalytically dehydrogenating ethyl benzene produced from benzene and ethylene. Styrene is used in enormous quantities in the manufacture of Buna S, by the copolymerisation of styrene and butadiene in aqueous emulsion. In this country styrene is about £110 per ton. The present cost of manufacture of styrene in the United States is £27 per ton based on ethylene from petroleum products at £33 per ton, and benzene at £12 per ton. It is forecast that the post-war cost of styrene will be £22 to £28 per ton, with ethylene at £11 to £16.5 per ton, and benzene at £6 to £8 per ton (8d. per gallon). A patent was recently applied for in this country for the separation of pure styrene from crude coal-tar solvent naphthas by an azeotropic method. The work was carried out by Dr. A. E. Coulson and others of the D.S.I.R. and is worth following up on a larger scale to increase production of this valuable raw material for synthetic rubber and the chemical industry.

8.—*Acrylonitrile* is made from ethylene chlorhydrin by reacting with sodium cyanide to give hydracrylic nitrile, from which acrylonitrile is obtained by dehydration. The synthetic rubber Perbunan S is made from acrylonitrile and butadiene. It was first made in Germany and the patent rights in America are held by the Standard Oil Co. of New Jersey.

9.—*Vinyl chloride* is produced commercially by: (i) the chlorination of ethylene to ethylene dichloride and partial dehydrohalogenation by treatment with alcoholic caustic: or (ii) by vapour-cracking ethylene dichloride. Vinyl chloride is a gas which on polymerisation yields polyvinyl chloride. The latter is a valuable raw material, the present price of which is about £500 per ton, for synthetic rubbers such as Koroseal and Flamenol. The latter, which is plasticised polymerised vinyl chloride, is manufactured by the General Electric Co., Ltd., and serves both as an insulation and as a finish for wires and cables.

Employment in New Chemical Industries

The introduction into the North-East of a number of units for separation of coke-oven gas into its constituents, and preliminary pilot plants for making some of the chemical products listed above will not go far to meet the potential demands for these materials and will not result in much additional employment at the outset. The Panel state that they are well aware of this, but claim that by starting on these lines the nucleus would be provided for a new industry capable of considerable expansion as soon as technical developments pointed the way. Much would depend on the foresight of those responsible for the initial scheme and the technical ability and vision of those entrusted with carrying it out. It is certain that unless progress is made, and without delay, we in this country will have to face a future *in which we process materials from imports and do not produce from our own resources.*

It is of interest to note, as regards processing of imports, that a large cracking and reforming plant for treating imported crude oil is to be built by the Manchester Oil Refinery, Ltd., within the next 18 months. It will produce large quantities of ethylene, styrene, cycloparaffins, resins, benzene, and toluene.

The superphosphate plant at Riga, which was seriously damaged during the war, has been partially restored. It is expected to produce 50,000 tons of fertilisers this year.

SAFETY FIRST

Warning of Hazardous Chemicals

by JOHN CREEVEY

IF all chemical products were *regarded* as hazardous, it is probable that greater caution would be exercised and that, as a result, accidents would be less frequent. On the other hand, if all chemicals were proved hazardous, it is quite likely that a much wider contempt for their properties would be evident, and that there would be a rise in common carelessness and in negligence on the part of workers in chemical industry and in chemical laboratory alike. For, in spite of all safety precautions and good advice which is proffered concerning hazards connected with certain chemicals, the number of accidents is still astonishingly high.

Even in some laboratories, there seems to be a disregard for the after-effects of vapours, which are allowed to reach the nose, throat, and eyes, although cupboards and hoods are provided. This state of affairs is hardly ever found in modern laboratories, which are run as a chemical laboratory should be run. But it is a little surprising to find unsatisfactory conditions for instance in some places where the future laboratory worker is receiving his post-war training, and also elsewhere as a legacy of makeshift arrangements because of the pressure of war work. The foundations of safely handling chemicals in industrial use should be laid in a practical manner while the student (or trainee) is being instructed, just as accuracy in weighing and clean working have to be emphasised as essential in quantitative analysis.

Injuries from Splashing

Among cases of minor injury, those caused by splashing are unduly high. In many cases splashing can be avoided by caution on the part of the worker; where splashing is unavoidable, its effects may be offset by wearing adequate protective clothing. The wearing of goggles or of a complete face-shield, and of rubber gloves or gauntlets is essential, wherever there is the least risk of splashing by strong acid or caustic alkali. Even when handling glass carboys in boxes with special cushioning (or merely in iron crates packed with straw) by the aid of a special hand-truck which picks up, carries, and sets down without need for the man to touch the carboy box, it is still advisable for the worker to wear tight-fitting goggles or a face-shield, with boots, gloves and apron made of rubber, or of some equally good acid-resisting material. This practice is enforced in certain works because it is fully realised that although the special hand-truck reduces the risk of accident, it does not entirely eliminate it.

All hazardous chemicals should be so labelled, and the labelling system should not be limited to chemicals in containers, as a measure for safe transport and storage. It is also wise to exhibit due notice of such risks while chemicals are in use, either in open or closed vessels, forming part of a particular plant. At the Zoological Gardens in London the authorities exhibit a warning upon certain cages that a particular animal is dangerous, and they tell you that the animal is likely to bite if you put your finger through the cage, or that the animal may kick violently against the door of the paddock as it takes a dislike to some visitors. These notices give a warning to visitors who may not be well acquainted with the animal's habits. So, too, in a chemical works, or in a works using chemicals, there may be strangers not familiar with the nature of some chemical products. It is well to warn such "strangers," but the labelling of vessels where certain chemicals are actually in use also serves a purpose in reminding the workers of dangers which may be present. The colouring system so usefully adopted on pipework might be extended to the various vessels and units forming a plant, with detailed warnings posted where any particular risk is present.

Labelling Containers

The labelling of containers to show the nature of risks from contact with a particular chemical known to have hazardous properties has been widely adopted. Yet because a particular chemical bears a warning label it must not be assumed that accidents directly traceable will be greatly reduced in the absence of other factors brought to bear upon the situation. There must also be an intelligent understanding of what the label is intended to convey, and likewise a conscientious regard for its message. Mere warning of hazardous nature, by itself, serves little purpose. There are degrees of hazard, danger, warning, caution, each of which has its correct use, with further need of details in words almost as brief. The particular risks involved must be emphasised so far as they may affect the person likely to come in contact with the chemical. For instance, a particular grade of some mineral acid is not merely a dangerous product, but one which should be labelled with such words as "Danger," "Corrosive Liquid," "Hazardous Vapour,"

the nature of the hazard being explained still further as "Causes severe burns"—"Do not breathe vapour."

Recognising the need of better standards and guides for the proper labelling of hazardous chemicals, the Manufacturing Chemists' Association in the United States set up a Label and Precautionary Information Committee, which published its first report early this year. Copies of this "Guide for the Preparation of Warning Labels for Hazardous Chemicals" can be obtained from the Association, 608 Woodward Building, Washington, D.C., together with another publication giving suggested labels for specific products (price 25 cents each). In the preparation of any precautionary label each product presents a distinct problem and must therefore be treated individually. Extreme care must be exercised in the choice of terminology, the statement being brief and simple. Basic considerations in the preparation of a precautionary label are: (1) determination of the hazards present for a particular chemical; (2) selection of appropriate statements for each hazard; and (3) arrangement of statements in the order of emphasis desired. Many chemicals will be found to have more than one type of hazard, in which case the statement for each type should be included on the label.

Ten Types of Danger

The hazards most frequently encountered fall under ten heads. There are inflammable liquids and oxidising agents which support combustion; inflammable solids and oxidising agents; vapours which are immediately toxic or extremely irritating, even on exposure for a short time or at low concentration; vapours which are hazardous from prolonged or repeated exposure, or by exposure at higher concentrations; vapours which are physiologically inert, but nevertheless require caution to be exercised (as where the vapour reduces the amount of oxygen available for breathing); harmful dusts; skin irritants which are definitely corrosive; chemicals causing skin irritations after repeated or continued contact; chemicals which are toxic by vapour inhalation or by skin absorption; and such chemicals as are toxic if taken internally (applying generally to products covered by the statutory definition of poison, or which prove destructive to the adult in doses of 60 grains or less).

The degree of hazard can be expressed only in relative terms. The purpose is twofold: to indicate the seriousness of the danger involved in handling a given chemical product, and to call attention to the precautionary instructions which follow. It is, however, impracticable to cover every possible contingency; some hazards may exist only in cases of improper use. All that is needed is to name the serious hazards, and to give warning against such abuses and accidents as are likely to be encountered. For example, in the case of a particular solvent, with a flash point between −5° and 25°C., the label may read: "Warning—Inflammable—Keep away from heat and open flame.—Use with adequate ventilation.—Avoid prolonged or repeated contact with the skin."—A similar solvent with flash point below −5°C. should be labelled "Danger—Extremely Inflammable—Keep away from heat and open flame—Keep container closed," apart from anything else it may be desirable to add. Each product has to be considered separately, bearing in mind that certain products may have to be labelled in keeping with regulations imposed by law quite distinct from all else that may be more helpful to avoid accidents. Should an accident occur, even then the labelling may serve a useful purpose, for in many cases "Instructions in Case of Accident" can be added to the wording, such as "In case of exposure remove to fresh air," or "In case of spillage flush to sewer with plenty of water."

The correct labelling of various chemical products in the manner outlined by the U.S. Manufacturing Chemists' Association can do much to make chemical workers more familiar with the properties and dangers of the products which they handle. In most cases, it would provide a sort of refresher course upon the nature of chemicals with which the worker deals, while persons who have newly entered industry will thus acquire knowledge essential to their safety as well as to that of their fellow-workers.

PHYSICAL SOCIETY'S EXHIBITION

The 30th Exhibition of Scientific Instruments and Apparatus, arranged by the Physical Society, will be held at the Imperial College, South Kensington, S.W.7, on January 1 (2.30-9 p.m.), January 2 (4-9 p.m.), and January 3 (2.30-9 p.m.).

Leading manufacturers of scientific instruments will be exhibiting their latest products in the trade section. The research and educational section will contain contributions from research laboratories, and experiments of educational interest. Discourses will be delivered at the following times:—

January 1, 5.30 and 8.15 p.m.: Captain T. Martin, "The Optical Industry in the War."

January 2, 5.30 and 8.15 p.m.: Sir Edward Appleton, F.R.S.: "Radar."

January 3, 5.30 and 9 p.m.: Dr. J. C. Swallow: "Modern Plastics and Cements."

Admission to the exhibition is by ticket only, obtainable from secretaries of Institutions and Scientific Societies, or from the Exhibition Secretary, 1 Lowther Gardens, Exhibition Road, S.W.7.

Bacteria in Paint

Types of Damage and Suggested Remedies

CONTENDING that the activity of bacteria in paint had not received adequate attention, in his experience, Mr. H. J. Bunker, in a paper presented to the London Section of the Oil and Colour Chemists' Association on November 23, devoted a considerable portion of his time to an extremely interesting account of his observations on the subject.

Water paints, he said, generally speaking, contained materials, particularly in the way of nitrogenous matter, which would encourage the development of bacteria, and an exceptional instance of bacterial activity in water paint had come to notice during the war. Drums of water paint were found bulging a few hours after filling, and some had actually exploded. Examination of the paint revealed that, apart from giving unpleasant odours, it contained a distinctive micro-flora of gas-producing organisms, which grew particularly well in a glucose medium. One of the principal constituents of the paint was carbon which, as a war-time measure, had been derived from the spent filters of a sugar-refining plant. It appeared that the carbon contained traces of sugar which could provide ample carbohydrates for organisms introduced with some of the other constituents. The bacteria had then developed so satisfactorily that sufficient gas was evolved to bulge and even burst the containers.

Reduction of Sulphates

An instance of an entirely different character of bacterial activity in paintwork was afforded by a recently-investigated case of discoloration of paintwork. The trouble had occurred on some internal partition walls of a building. The bricks had been plastered, and three weeks afterwards a coat of cement primer had been applied; the building was central-heated. After a few days, dark patches had appeared on the paint surface, and although undercoats were applied to the primer, before long the patches had reappeared. Inspection showed that the walls had received, besides the primer, at least three coats of paint, and in some places as many as six. The paint was said to be free of lead, but small amounts of lead might have been used as drier. Examination of the paintwork having indicated that the blackening was due to sulphide, samples of the paint film and other materials were examined for the presence of sulphate-reducing bacteria. Those organisms, of which the type species was *Vibrio desulphuricans*, were strict anærobes, flourishing only in the absence of oxygen, although that absence need be only local. Their distinctive feature was the ability to reduce sulphates to sulphide, and so, in the presence of lead or iron, for example, to cause the formation of black sulphide.

Bacteriological examination strongly supported the view that the discoloration was due to the activity of such bacteria. They were active in the sanded plaster undercoat and in the samples of sand, but not in the other components of the wall. The sand was the only material which had not undergone heat treatment before use. As the organisms were of common occurrence in sands, clays and earthy materials generally, it was quite easy for them to find their way into the building materials; but where such substances were subsequently subjected to heat they would be present only through subsequent contamination.

In another instance, where a similar explanation was sought, the cause of the defect had remained unproven. An outside wall had been reconditioned with a putty filler, and then repainted. Subsequently it had shown extensive black discoloration, and chemical analysis had indicated the presence of both sulphides and sulphates in the filling. Bacteriological examinations revealed no sulphate-reducing bacteria in any of the samples. Examination for mould fungi showed none in the unaffected areas of the wall, but the counts for the supposedly infected material ran up to nearly a quarter of a million organisms per gram. It could only be said that the blackening of the paint was probably not due to sulphate-reducing bacteria, and might well have been caused by infecting fungi. Those organisms might have been responsible for the production of sulphides but the point was not proved.

Anærobic Corrosion

Speaking of metallic corrosion in anærobic conditions, Mr. Bunker said that metals from which air was excluded were subject to corrosion of a type which was characterised by certain features such as the presence of sulphide sulphur in the corrosion products, and, in the case of cast iron, of a graphitisation of the material. Another distinctive feature of that type of corrosion was the presence of appreciable numbers of sulphate-reducing bacteria at the corrosion areas. It might now be taken as proven that that type of corrosion was due to the activity of those organisms.

In practice, that type of anærobic corrosion was met with in heavy clay soils and other waterlogged conditions, *i.e.*, where oxygen was absent and a certain amount of sulphate was present. It occurred also at the bottom of gasholders and oil tanks, and

even in the interior of pipes, water meters, etc., if localised conditions of stagnation prevailed, as they might do under heavy coatings of rust or other accumulations. So far as was known, the most serious instances of corrosion due to those organisms occurred in pipe-lines buried in sulphate-bearing soils.

Protective Methods

Apart from procedures such as cathodic protection, which had not yet been fully investigated in that particular respect, there were two practical ways of dealing with that type of corrosion trouble. One was to surround the pipe with sand or gravel, so as to ensure access of oxygen and hence suppress the growth of the bacteria; the other was to coat the pipe to prevent access of the responsible bacteria to the pipe surface. At the moment it could not be said whether it was practicable to apply a coat which was toxic to the bacteria. The paint or coating must be hard, because it must withstand damage in the laying of the pipe and the back-filling of the trench. On the other hand, if the coating were so hard as to be totally inert, the poisonous material incorporated in it would not be liberated and hence could not kill the bacteria. Antiseptics could work only through the agency of their solubility, since it was only in the water phase that they could reach the cells to which they were toxic. Substances which were too soluble were obviously ruled out, since before long they would be leached away by subsoil water movements.

The alternative of using slightly soluble toxic substances such as copper or mercury soaps incorporated in a sufficiently hard base might be effective, and was certainly worth trying if the cost were reasonable. As to the incorporation of traces of toxic metallic ions, such as copper, into the material of the pipe itself, trials with steels containing toxic quantities of copper had shown unsatisfactory results. His own experiments had indicated, however, that some stainless steels were resistant to that micro-biological type of corrosion.

At the moment the most satisfactory treatment of mains seemed to be the application of several layers of blown bitumen, put on with care and in considerable thickness. There appeared, however, to be a future for some coating of a less cumbersome nature, and possibly the line of approach was to use vitreous enamels or plastics: but the question of coal must not be forgotten.

For all practical purposes, the metallurgical industry in the U.S. zone of Germany has been idle since the occupation. The steel industry has a capacity of roughly 400,000 tons yearly, or less than 2 per cent. of the total German capacity. There is at present no production of aluminium or magnesium.

Isomerisation Studies

Effect of Magnesium Bromide

IN previous work of H. Suida and F. Drahowzal[1] it was shown that a transition of the double linkage is highly improbable with the Grignard synthesis of olefines. However, Asinger (*Ber.*, 1942, *75*, 1260), succeeded in forming small amounts (5-7 molecules per cent.) of tridecene-2 by the Grignard synthesis of tridecene-1 from decyl bromide and allyl bromide, by re-utilising the isomerising effect of the magnesium bromide formed during the reaction. To support the views arrived at, a preparation of dodecene-1, which contained 2.36 molecules per cent. of dodecene-2, was boiled for 6 hours, using a reflux condenser, with a suspension of magnesium bromide in benzene. The reaction product contained about 17 per cent. of isomerised dodecene, principally dodecene-2 but, in addition, also traces of dodecene-5; about 10 per cent. of the dodecene used was polymerised under these conditions. With an isomerising experiment conducted at 35°C. and using an ether solution, a smaller isomerising effect was obtained, only because of the lower temperature. Finally, in criticism of the work by Suida and Drahowzal and of the method given by F. Asinger[2] for ascertaining the constitution of the olefines by oxidative splitting, it should be remarked that under the conditions selected by F. Asinger, no further oxidation of the resulting fatty acids takes place.

Preparation of Olefines

By catalytic dechlorinating or dehydrating of the higher molecular alkyl chlorides or alcohols respectively,[3] a mixture of olefines is obtained in which the concentration of the double linkage, differentiating the olefine isomers, is determined by the free energy with strongly isomerically acting catalysts. The alpha olefine, which is always the isomer higher in energy, occurred in the lowest concentration; while the olefine isomers, whose double linkage occurred between two methin groups and which are collectively lower in energy, and the isomeric alpha-olefines occur in about equimolecular concentrations. With less efficient isomerising catalysts, this equilibrium condition is not attained, and, in the olefine mixture formed, the isomers with an interior double linkage are less strongly represented.

REFERENCES
[1] SUIDA and DRAHOWZAL, *Ber.*, 1942, *75*, 991.
[2] ASINGER, *Ber.*, 1942, *75*, 656.
[3] ASINGER, *Ber.*, 1942, *75*, 1247.

Three factories in Finland, at Hangö, Seinajoki, and Helnola are producing lubricating oils from tar at a present monthly rate of 200,000 kg.

French Chemical Notes

Improvement Maintained : Better Figures Expected

CONDITIONS in the French chemical industry during the last quarter have shown a marked improvement, mainly owing to increasing coal allocations. If only regular supplies of raw materials could be guaranteed, the industry would be well on the way to recovery, but an amelioration in this branch is only part of the general question of increasing supplies in all other industries in France, and certain industries are being given priority at the expense of others. In considering plans for imports, for example, the chemical industry put forward its claims, subject to the availability of transport. It would be idle to deny that the transport crisis is causing a good deal of anxiety in the chemical industry. In November, for example, only 50 per cent. of vehicles required were allocated. The shortage is causing particular hardship to the sodium carbonate, the soap, and the glass industries.

During the third quarter, imports of pyrites were distributed, and the allocation of acid increased by 30,000 tons to 80,000 tons. As imports arrived, it became possible for 200,000 tons of acid to be distributed, of which 80,000 tons went to the manufacture of phosphate fertilisers, and an improvement is expected early next year. Soda production is also showing progress, distribution of materials being based on import plans. Distributions have now risen to 55,000 tons for sodium carbonate and 15,000 tons for caustic soda. However, requirements cannot yet be satisfied, and the level of production must be increased further. Glass works, which placed orders for 26,000 tons of sodium carbonate, have to make do with 18,000. In the manufacture of artificial fibres, deliveries of caustic soda are better, though they do not cover the industry's needs.

Heavy Water Production

A slight increase in production of heavy water has enabled factories to store 14,000 tons, but this is still lower than the figure necessary to satisfy all needs. It is considered imperative that stocks should be maintained and even increased in the future. It is expected to produce 24,000 tons and to import 6000 tons.

The campaign for raising the production of sulphur and copper sulphate has gone relatively well. Arrivals of sulphur are now coming in at an encouraging rate, while the production of copper sulphate seems to be assured by the provision of copper and sulphuric acid. There is a possibility that all needs in this field may be satisfied in 1946.

The position in the provision of industrial fats is improving. The programme for 1946 envisages a total of 200,000 tons, and 25,000 tons have already been produced in the current quarter, against 14,100 tons in the preceding quarter. Glycerine production, which dropped at the beginning of the year owing to the coal shortage, is now slowly developing. At least 60 tons are expected to be available this quarter, but the supply position is far from satisfactory.

The output of household soaps and detergents is progressing, while production of stearine and oleine is still suffering from the lack of raw materials. The soap industry, however, is benefiting from the increasing production of fatty acids. The following are some figures indicative of conditions in this branch: 3635 tons of household soap are being produced monthly, compared with 914 tons in September, 1944, while the monthly average for 1938 stood at 19,104 tons; 4909 tons of detergents, compared with 711 tons in September, 1944, and 7540 tons in 1938, 64 tons of stearine, compared with a 1938 average of 165 tons, 45 tons of oleine against 753 tons in 1938, and 59 tons of candles against 447 in 1938.

Fire at Chemical Works

Large Stocks Destroyed

FIRE brigades from several parts of the West Riding were summoned to the ammonia works of Brotherton & Co., Ltd., Calder Road, Wakefield, in the early hours of Wednesday last week. Danger from the clouds of sparks that were being blown towards the neighbouring Shell-Mex petrol storage yards was averted by the action of the N.F.S. It was thought that the ammonia fumes might present a greater danger than the fire itself, but the flames were controlled within about 1½ hours and there was no necessity for the firemen to wear breathing apparatus.

Equipment, including stills and vats and large and valuable stocks of chemicals, were destroyed. The main building was completely destroyed and storehouses were gutted, the contents, mainly carbonate of ammonia, being destroyed. Big stocks of finished products awaiting shipment were also lost, having been either consumed in the fire or destroyed by the water. Salvage is expected to be very small.

Chrome mines at Kukes, in Albania, were exploited on a large scale by the Germans, who damaged the installations on their retreat.

Parliamentary Topics

Scientific Staff

IN the House of Commons last week, Mr. Pickthorn asked the Financial Secretary to the Treasury whether the new salary scales for the Scientific Civil Service would be so applied that existing staff should not be at a disadvantage in comparison with new entrants.

Mr. Glenvil Hall: Existing scientific staff will, on being brought into the new organisation, be given sufficient credit for previous service to put them broadly on equal terms with new entrants of the same age and quality.

Industrial Controls

Mr. Bower asked the President of the Board of Trade whether he would consider setting up some central authority for the purpose of bringing about some immediate improvements in the operation of the industrial controls system in the interests of more rapid expansion during the transition period.

Mr. Ellis Smith: No, sir.

Fuel Efficiency Bulletins

Squadron-Leader Donner asked the Minister of Fuel and Power how much was being spent by his Department in sending out bulletins on the efficient use of fuel, and the cost of the salaries of inspector-engineers.

Mr. Shinwell: The cost to this Ministry of the preparation of Fuel Efficiency bulletins is approximately £500 per annum. The annual cost of the salaries, including war bonus, of the 81 fuel engineers directly employed is £44,500 per annum.

Industrial Development (Scotland)

In reply to Sir W. Darling, the President of the Board of Trade detailed the steps already taken in the industrial development of Scotland, including the provision of seven new trading estates and the building of new factories on the four existing estates. In addition, privately-financed factory building is being encouraged by the grant of early building licences. By the end of October, a total of 79 new factory building schemes, including those on trading estates, to employ more than 16,000 people, had been approved, and many more were under consideration. Eight Government-owned factories have been allocated for civilian production, in addition to two aircraft plants now engaged on the temporary housing programme. Four "standard" factories, to employ some 3000 workers, have also been built in Scotland and allocated for civilian production.

Calcium Cyanamide

Mr. P. Freeman asked the President of the Board of Trade whether he was aware of the pressing demand of agricultural interests to secure supplies of calcium cyanamide as fertilisers; whether supplies are now available in Norway; whether the Combined Food Control Board in Washington would provide the necessary permits; and whether he would grant the necessary import licences to make this commodity available at the earliest possible moment.

Sir S. Cripps: I understand that production of this material is being resumed in Norway; but I am advised by the Minister of Agriculture that there is no urgent demand for its use as a fertiliser in this country and it is not at present proposed to apply to the Combined Food Board for an allocation of Norwegian supplies.

Factory Medical Officers

Replying to Mr. Hastings, the Minister of Labour said that at the end of 1944, there were 13 full-time medical inspectors and 1862 examining surgeons appointed under the Factories Act, the latter doing varying amounts of medical work at factories which does not occupy the whole of their time. In addition, there were approximately 180 doctors exercising full-time medical supervision, and 890 exercising substantial medical supervision in factories on a regular part-time basis. During the past year there had been no substantial change in these numbers.

CANADA'S EXPORT TRADE

Canada's exports for the first nine months of this year reached $2,546,620,876, practically the same total as in the corresponding period of 1944. Exports of chemicals and allied products rose from $72,237,000 to $91,712,000.; however, eliminating explosives, the figures read $64,217,000 and $61,701,000. Fertiliser shipments rose from $18,000,000 to $21,000,000, and there was an increase in acid exports. Exports of iron and products thereof receded from $593,000,000 to $500,000,000, but exports of non-ferrous metals and products show a gain of $30,000,000 to $275,000,000. Among non-metallic minerals, gasoline exports doubled to $6,754,000, and asbestos exports were up from $15,000,000 to $17,000,000. The total for this class is $46,103,000 ($43,677,000).

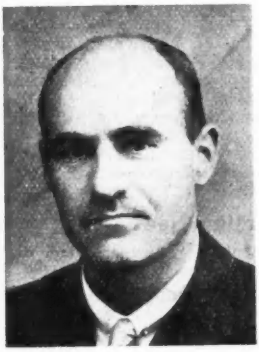
On the Gold Coast, several large deposits of bauxite had been discovered by the Geological Survey, the largest of which were at Sefwi Bekwai and Mount Eyanema, said Dr. Junner, in the second of the Imperial Institute's series of lectures on the mineral resources of the colonies. These deposits had been opened up during the war and several hundred thousand tons of bauxite were shipped by means of a special railway, roads, and loading plant.

Personal Notes

MR. A. MORTIMER has been appointed director of the Beecham Group and of Eno Proprietaries and managing director of J. C. Eno.

DR. H. J. EMELEUS, Reader in Inorganic Chemistry in the University of Cambridge, has been appointed to a Professorial Fellowship at Sidney Sussex College.

DR. D. M. NEWITT, M.C., D.Sc., Ph.D., F.R.S., has been appointed to the Courtaulds Chair of Chemical Engineering tenable



Professor D. M. Newitt, appointed to the Courtaulds Chair of Chemical Engineering.

at the Imperial College of Science and Technology, from October 1 last. He was appointed Reader in Chemical Technology at the college in 1937, and since 1941 he has been Director of Scientific Research of the Inter-Services Research Bureau.

At the annual meeting of the British Cast Iron Research Association held in London on December 12, DR. H. HARTLEY, of Radiation, Ltd., formerly chairman of the Council, was elected president.

MR. W. MCNEAR BAND has been elected president of the U.S. Monsanto Chemical Co., succeeding Mr. C. Belknap, who continues as chairman of the executive committee.

PROFESSOR A. R. TODD, F.R.S., Professor of Organic Chemistry in Cambridge University, is visiting Switzerland as the guest of the Basle Chemical Society and under the auspices of the British Council, to give lectures in Basle and other Swiss towns.

MR. W. MORLEY DAVIES, M.A., B.Sc., F.R.I.C., Provincial Advisory Chemist, Harper Adams Agricultural College, has been invited to become Provincial Advisory Officer for the East Midlands, in the new National Agricultural Advisory Servivce.

DR. C. E. H. BAWN, of the Department of Chemistry of Bristol University, has become the Bristol area representative of the Society of Chemical Industry, while DR. S. H. HARPER, University College, Southampton, is to be the Society's first local representative there.

MR. GASTON F. DUBOIS, vice-president and member of the executive committee of the Monsanto Chemical Company, and one of the foremost figures in the American chemical industry for 40 years, has retired. He will continue as a director and consultant.

MR. J. M. WISHART will relinquish his post as general manager of the Manchester Corporation Rivers Department on December 31 to join the board of Ames Crosta Mills & Co., Ltd., of Heywood and London, manufacturers of sewage purification and other chemical plants, as a technical director.

MR. B. C. HUGHES has been released from service as Adviser to the Sulphuric Acid Control on matters connected with the importation and distribution of sulphur. Mr. Hughes held this position from the outbreak of war until November 30. His services in an unofficial advisory capacity will still be available to the Control.

At the annual meeting of the British Colour Makers' Association held on November 21, MR. J. CROMBIE, of James Anderson & Co. (Colours), Ltd., (chairman), MR. C. G. A. COWAN, of Cowan Brothers (Stratford), Ltd., (hon. treasurer), and MR. A. J. HOLDEN (hon. secretary) were re-elected. MR. S. K. ROBERTS (I.C.I., Ltd., Dyestuffs Division) succeeds Mr. H. G. Ferguson as vice-chairman. The other members of the council are MESSRS. K. BURRELL (J. W. & T. A. Smith , Ltd.), H. G. FERGUSON (Cornbrook Chemical Co., Ltd.); A. H. ORCHARD (The Golden Valley Ochre & Oxide (Colours) Co., Ltd.; V. WATSON (Cromford Colour Co., Ltd.); and H. A. WILSON (The Derby Oxide & Colour Co., Ltd.).

Obituary

DR. JAMES WATT, W.S., one of the best known men in the city of Edinburgh, and chairman of T. & H. Smith, wholesale manufacturing chemists, Edinburgh, and of several other companies, died on December 3. He took a leading part in industrial developments and although 82 years of age was still active in business.

MR. ALFRED LUCAS, O.B.E., F.R.I.C., who died at Luxor on December 9, aged 76, was honorary corresponding secretary in Egypt of the Royal Institute of Chemistry and held the post of chemist to the Egyptian Department of Antiquities. He was present (says the Cairo Correspondent of *The Times*) at the opening of the sarcophagus of Tut-ankh-Amen and wrote the appendices on the chemistry of the tomb in Dr. Howard Carter's work "The Tomb of Tut-ankh-Amen."

General News—From Week to Week

The sample post service to Bulgaria, Rumania and Yugoslavia has been restored.

The telephone service with Norway for commercial calls was reopened on December 7.

Letters and boxes posted to Holland may now be insured up to a maximum insured value of £400.

The Shell Union Oil Corporation of New York has made a gift of £25,000 to the Help Holland Council, the British organisation sending clothing, etc., to Holland.

The library of the Chemical Society will be closed for the Christmas holidays from December 24 until December 27, both dates inclusive.

The salt industry has been added to the list of basic industries and essential services into which the Ministry of Labour and National Service is anxious to stimulate an inflow of workers.

The Rt. Hon. Herbert Morrison, M.P., Lord President of the Council, attended the meeting of the Parliamentary and Scientific Committee on December 11, in order to answer questions about the committee which he has set up to survey the scientific resources and manpower of the country.

Amended draft regulations for 1946, applicable to the grinding or polishing of castings or other articles consisting wholly or mainly of magnesium have been issued by H.M.S.O., price 1d. Interception, removal and disposal of dust are dealt with, together with protective clothing, prohibition of smoking, naked lights, etc. These regulations do not apply to the manufacture of magnesium powder.

Wholesale prices in November remained at the same level as in October. The index figure for industrial materials and manufactures declined by 0.1 per cent. from 175.1 to 174.9. The index for chemicals and oils moved from 147.4 to 146.3 owing to price reductions for petroleum products. The figures for coal, iron and steel and non-ferrous metals remained unchanged.

Messrs. Brotherton, Ltd., have undertaken to provide £1000 a year for seven years to establish a Research Lectureship in the department of Organic Chemistry at Liverpool University. In addition, Mr. Charles R. Brotherton has given £1000 to form the nucleus of an equipment fund for the same department. It is understood that the new lecturer, when appointed, will work in the laboratories which were finally completed in the early part of the war, and, fortunately, escaped anything more than superficial damage.

An enlarged price list is being issued in January by L. Light & Co., Ltd., Old Bowry Laboratories, Wraysbury, Bucks, fine chemical manufacturers. This list will include about 750 organic research chemicals, 150 of which have never been available in this country before.

The effect of those provisions of the Trading with the Enemy Act, 1939, and the Custodian Order, 1939, which remained in force after the liberation of Yugoslavia, now cease to apply in respect of money and property accruing on or after December 3, 1945, to persons resident in that territory. Certain restrictions on trading with Yugoslavia, arising out of the Trading with the Enemy Legislation, have been lifted, but the resumption of commercial relations with Yugoslavia presents difficulties since banking channels between the two countries have not yet been restored.

Foreign News

The establishment of an export trade in kaolin has been recommended in Ceylon.

A company formed recently in Vancouver, with a capital of $50,000, will manufacture optical and scientific instruments.

Levant Glue, Ltd., Tel Aviv, is now supplying steamed bone flour fertiliser to Greece via UNRRA.

A coconut oil factory at Waln Bay, Fiji Islands, is almost complete, but will not go into production until late in 1946.

Sulphur production in Spain amounted to 14,931 metric tons during the first half of 1945, compared with 9847 tons in the corresponding period of 1944.

A major project to expand the production of nylon yarn at Martinsville, Va., at a cost of $10,000,000, was announced by E. I. du Pont de Nemours

Three leading scientists of the Swiss Geigy Company visited the United States recently in order to exchange information and inspect laboratories.

Nobel prizewinners who received their awards at the traditional festival at Stockholm on Monday included Sir Alexander Fleming, Sir Howard Florey, Dr. E. B. Chain (Medicine), and Professor A. Wirtanen (Chemistry).

The American Magnesium Corporation, a subsidiary of the Aluminium Company of America, announces that it will close its two Cleveland plants and transfer operations to a larger plant in Buffalo, N.Y. One of these magnesium plants will be converted to the manufacture of aluminium castings.

A bill proposing State control of uranium deposits in the Belgian Congo and the withdrawal of private concessions there has been introduced into the Belgian Parliament by a Socialist deputy.

A 270-page technical book, entitled "Ball and Roller Bearing Engineering," has been published by S.K.F., Philadelphia, as a fundamental text on all phases of bearing applications to industry.

An educational programme on magnesium, sponsored by the American Society of Tool Engineers, Inc., has been held in Chicago and further similar meetings will be held throughout the country.

The Burgomaster of Liége has presented the Liberation Medal to Sir Alexander Fleming, discoverer of penicillin, who visited Liége University on December 3 and inspected the new biochemistry laboratory.

British and American interests are contemplating a proposal to finance the exploitation of the Paz del Rio iron-ore deposits, Colombia, for which a concession has been granted to the Instituto de Fomento Industrial.

Since 1943, most of the 25 glass factories operating in Portugal have considerably renewed or expanded both their automatic and semi-automatic plant equipment. Most of the semi-automatic equipment in use came from Spain.

Several Italian mining companies are reported to be interested in American mining and metallurgical equipment and metallurgical processes. The present equipment is largely of German manufacture, and it will be difficult or impossible to obtain spare parts.

To concentrate the technological and research activities of Celanese Corporation of America in the fields of textiles, plastics and chemicals in a single central laboratory, the company has acquired buildings at Summit, N.J. It is estimated that eventually about 500 scientists, chemists and technicians will be at work in the new unit.

A new plant for the manufacture of synthetic lubricants in France has been constructed and put into operation this year at Marseille-l'Etaque by the Société Standard-Kuhlmann, according to the annual report of the Société Standard Française des Petroles, which in 1943 participated in an increase of the capital of Etablissements Kuhlmann for carrying out this project. Preliminary repairs also have been completed of a number of factories and installations of the Standard Française des Petroles, particularly of the refinery at Port Jérôme.

Renewed consideration is being given by an Australian oil company to a proposal made before the war for the erection of a refinery at a cost of £A250,000. The plant would have an annual capacity of several million gallons of fuel oil, lubricating oil, and bitumen, and would be the first of its kind in Australia.

All restrictions on the sale of penicillin to the public have been removed in Canada and it is now as freely available in any drug store as aspirin. As a result a tremendous sale of penicillin throat tablets, ointments, and pills is reported to have developed. The Canadian market is at present supplied by one deep-fermentation plant and two flask-type units.

The Germans developed a new cutting alloy during the war which required no tungsten and thereby released that valuable metal for war purposes, according to the director of research at the Powder Metallurgy Laboratory, Stevens Institute of Technology. It consists essentially of vanadium and titanium carbides bonded with metallic nickel.

A sulphuric-acid factory is under construction in Palestine by Taasiyah Chemith Tel-Aviv, Ltd. The annual capacity will be 15,000 metric tons, to be used in the manufacture of superphosphates. Arrangements have been made for the import of machinery and materials. The firm will use the sulphuric acid in its manufacture of superphosphates. During the war, sulphuric-acid production was begun by the Consolidated Refineries, Ltd., Haifa Bay, but output was not sufficient to meet requirements.

Four brand-new munitions plants in Australia—two in Victoria, one each in N.S.W. and South Australia—which originally cost £2,000,000, may shortly be used for the production of sulphate of ammonia, says the *Fertiliser Journal*. The four factories were originally built for the production of synthetic ammonia for explosives, but by the time they were erected the danger of invasion had passed, and it was found more convenient to secure the necessary ammonia from other sources.

The first Congress of Italian Chemical workers has recently been held in Milan. Delegates of all regions and provinces beyond the "Gothic Line" were present, and expressed the need for obtaining a collective working contract. At the moment, there are regional or provincial agreements which contain no provision for the differences in cost of living in different provinces. The working-out of a national statute was urged by several delegates, to give uniformity, fixed salaries and hours.

YPFB, the Bolivian semi-State organisation in charge of petroleum production, is considering the possibility of establishing an oil refinery at Cochabamba at a cost of $5,000,000. The project would be financed either by loans from the Banco Central or from the Bolivian Development Corporation.

Forthcoming Events

December 17. Institute of Fuel (Scottish Section). Royal Technical College, Glasgow, 5.45 p.m. Dr. V. H. Smith: "District Heating."

December 17. Electrodepositors' Technical Society. Northampton Polytechnic Institute, St. John Street, Clerkenwell, London, E.C.1, 5.30 p.m. Mr. W. Roebuck and Mr. A. Brierley: "The Tainton Galvanising Process for Brylanised Wire."

December 17. Society of Chemical Industry (Plastics Group and Manchester Section) and **Institution of the Rubber Industry** (Manchester Section). Engineers' Club, Albert Square, Manchester, 6.15 p.m. Dr. S. K. Skinner: "Synthetic Polymers in the War Effort."

December 18. Royal Institution of Great Britain. Albemarle Street, London, W.1, 5.15 p.m. Sir Henry Dale, Pres.R.S.: "Recent Developments in Chemical Therapeutics, III—Penicillin and other Antibiotics."

December 18. S.C.I. (Agriculture Group). Chemistry Lecture Theatre, Imperial College, Imperial Institute Road, London, S.W.7, 2.30 p.m. Rôle of the Chemist in Dairying: Dr. A. L. Provan: "The Chemist and Milk Production"; Mr. E. V. Anderson: "The Chemist in Milk Processing and Manufacture."

December 19. Institute of Fuel (Yorkshire Section). Leeds University, Leeds, 2.30 p.m. Mr. J. Crossland: "The Preparation and Use of Fuel."

December 20. Society of Chemical Industry (Road and Buildings Materials Group). Gas Industry House, 1 Grosvenor Place, London, S.W.1, 6 p.m. Film evening. Mr. G. J. Hancock: "Mastic Asphalt"; Mr. P. A. Valton: "Road Aggregates"; and Mr. H. S. Keep: "The Wet Sand Asphalt Mix."

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfaction

CLYMAX SUPPLIES, LTD., Birmingham, manufacturers of insecticides, etc. Satisfaction November 19, of debenture registered July 4, 1945, to the extent of £250.

Company News

Renfrew Foundries, Ltd., has increased its nominal capital by the addition of £699,900 in £1 ordinary shares beyond the registered capital of £100.

Lee Temple & Company, Ltd., have increased their nominal capital by the addition of £5000 in £1 ordinary shares beyond the registered capital of £1000.

Colloidal Chemists, Ltd., have increased their nominal capital by the addition of £900 in £1 ordinary shares beyond the registered capital of £100.

Sulphide Corporation, Ltd., reports a net profit, for the year to June 30, of £21,806 (£19,819). A dividend of 5 per cent. (same) on preference has been declared.

Wailes Dove Bitumastic, Ltd., with a net profit of £21,083 (£21,221) for the year ended September 30, are paying a final dividend of 10 per cent., making 15 per cent. (same).

United Match Industries, Ltd., report a net profit, for the year to October 31, of £12,623 (£12,475) and declares a first and final dividend of 33⅓ (same) per cent. on deferred.

Crystalate, Ltd. reports a trading profit to September 30, of £16,780 (£37,472). The net profit is £13,059 (£11,385). An ordinary dividend of 6 per cent. (net) has been declared.

Turner and Newall, Ltd., report a consolidated trading profit, for the year ended September 30, of £3,795,889 (£4,161,838). Trading profit of the parent company was £2,493,142 (£2,513,915), while the net profit totals £629,462 (£545,665). A final ordinary dividend of 8¾ per cent., makes a total distribution of 12½ per cent. (same).

English Clays Lovering Pochin and Co., Ltd., are to create 63,464 additional 5½ per cent. cumulative first preference shares of £1, which will be issued in satisfaction of the entire share capital and certain debts of Port of Par, Ltd. The latter's Cornish harbour has for many years shipped a substantial proportion of the company's output and a considerable saving in manufacturing and transport costs is envisaged as a result of the purchase.

New Companies Registered

Ansol Chemical Co., Ltd. (400,752).—Private company. Capital £500 in £1 shares. Consulting, analytical, manufacturing, and general chemists, etc. First directors: S. I. Lyons and Anne Lyons. Registered office: 4 Broad Street Buildings, London, E.C.2.

Charles Tennant and Company (Northern Ireland), Ltd. (N.I.1969).—Private company. Registered in Belfast. Capital £50,000 in £1 shares. Chemical brokers and merchants. Subscribers (each with one share): J. N. Duff, Owenstown House, Foster Avenue, Dublin, and C. Lane.

Consolidated Paint Co., Ltd. (400,767).—Private company. Capital £500 in £1 shares. Manufacturers of and dealers in paints, varnish, polish, lacquer, cellulose, oils, colours, etc. First directors: B. A. Arnold and Annie A. Arnold, both of 35 Melrose Avenue, London, N.W.2.

Sutcliffe & Gledhill, Ltd. (401,088).—Private company. Capital £7,500 in £1 shares. To acquire the business of chemical manufacturers carried on at Idle Moor, Bradford, as "Sutcliffe and Gledhill." Directors: C. E. S. Sutcliffe, A. H. Sutcliffe, A. Gledhill. Registered office: 9 Charles Street, Bradford.

Enthoven Chemicals, Ltd. (401,542).—Private company. Capital £10,000 in £1 shares. Manufacturers of and dealers in organic and other chemicals, etc. Subscribers: J. Madders, 53 Hedge Lane, Palmers Green, N.13, A. M. Bell. Solicitors: Roney and Co., 42-5 New Broad Street, London, E.C.2.

Floorlife and Chemicals, Ltd. (400,976).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in chemical substances and of composition materials used for building construction and maintenance purposes, waterproofing, etc. Directors: E. A. Cadie, A. W. Beecham. Registered office: 62-3 Fenchurch Street, E.C.3.

Tennants Tar Distillers and Engineering Supplies, Ltd. (N.I.1971).—Private company. Registered in Belfast. Capital £50,000 in £1 shares. Manufacturers, distillers and blenders of crude oil, tar, creosote, and coal-tar oils of every description. Subscribers (each with one share): T. Jackson, J. N. Duff, Owenstown House, Foster Avenue, Dublin.

Kelro Chemical Company, Ltd. (401,557).—Private company. Capital £2000 in 1500 redeemable preference and 500 ordinary shares of £1 each. Manufacturers of and dealers in chemicals, etc., used in the manufacture of soaps, etc. Directors: W. P. Robinson, A. W. Keeble. Registered office: 23 Crabb Street, Rushden, Northants.

Cathcode Chemicals, Ltd. (401,610).—Private company. Capital £1500 in 1000 shares of £1 each and 10,000 shares of 10s. each. Refiners, manufacturers, manipulators, importers and exporters, etc., of ore, minerals and mineral substances, chemicals and chemical substances, etc. Subscribers: R. Moore, 45 Beaminster Gardens, Ilford; K. D. Raby. Secretary: Wm. H. Stocks. Registered office: 4 Lloyd's Avenue, E.C.3.

Tubes, Foils & Capsules (Export), Ltd. (400,361).—Private company. Capital, £10,000 in £1 shares. To promote export business and industrial, technical and other development, etc. Directors: Otto J. Bruun (permanent governing director), The White House, Stoke Park, near Slough; J. J. Stevens. Solicitors: Durrant, Cooper & Hambling, 70/71 Gracechurch Street, London, E.C.3.

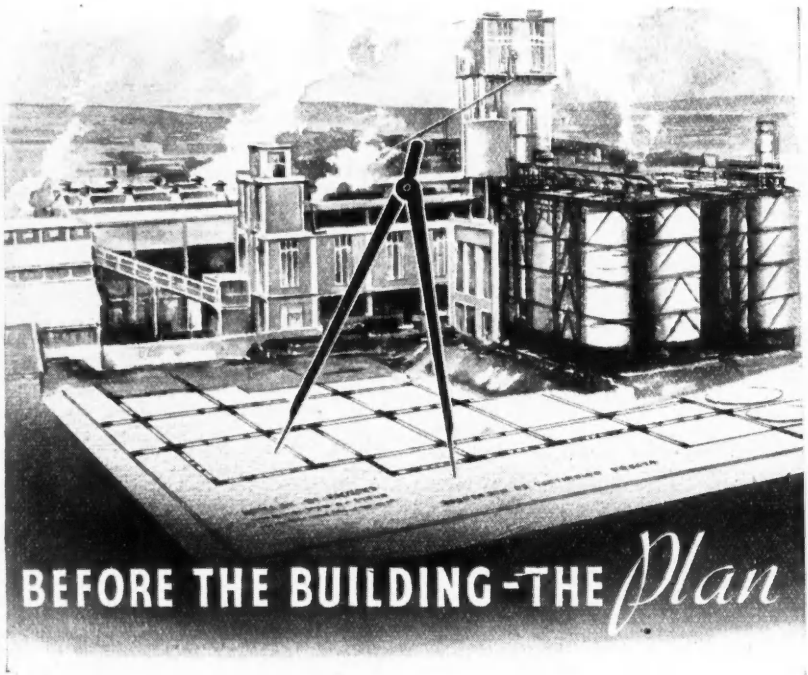
Veecreme, Ltd. (400,744).—Private company. Registered November 19. Capital £500 in 500 shares of £1 each. Objects: to carry on the business of manufacturers of, agents for, and dealers in chemicals, gases, drugs, disinfectants, fertilisers, salts, acids, oils, glues, varnishes, etc. Directors: W. Burrows, G. A. Ward, T. H. Davies. Registered office: 91 Canterbury Road, Davyhulme, Lancs.

Cellulose Enamelling & Plating Co. (Kent), Ltd. (400,764).—Private company. Capital £1000 in £1 shares. Manufacturers and exporters of and dealers in enamel, varnish, chromium, nickel, lacquer, polish and other plating, polishing and finishing materials, including cellulose processes, etc. First directors: Stanley Cox, R. H. Stevens. Registered offices: 151 Station Road, Sidcup, Kent.

Metal Porcelains, Ltd. (400,738).—Private company. Capital £20,000 in 100,000 4s. shares. Manufacturers of and dealers in vitreous and porcelain enamels of all descriptions, any other preparations for the protection, preservation or other treatment of iron, steel and metal work, etc. Directors: S. Hallsworth, A. G. Read, C. C. Pettit, T. G. Fallon, and Wilfred Cook. Registered office: British Mills, Cornwall Road, Smethwick, 40, Staffs.

Chemical and Allied Stocks and Shares

STOCK markets have been quiet, partly because holiday influences are beginning to affect the volume of business, and, moreover, attention was centred on the debate in Parliament on the U.S. loan terms. The forthcoming Moscow meeting of Foreign Ministers also made for a waiting attitude. Shares of companies associated with textiles and electrical equipment and of other export groups attracted some attention following the U.S. loan terms, as it is hoped the way is being opened for accelerating development of international trade. Later, however, prices tended to ease, and in other directions nationalisation uncertainties, and renewed fears of labour unrest were adverse influences. British funds also eased earlier in the week, 2½ per cent. Consols and other



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long-dated stocks losing part of earlier gains; this was attributed partly to the possibility that the Government's cheaper money policy might come under discussion during the Parliamentary debate on the U.S. loan.

Shares of chemical and kindred companies recorded small movements generally, reflecting surrounding market conditions. Imperial Chemical were steadier at 40s., but Lever & Unilever eased to 49s. 3d. and Turner & Newall receded to 81s. 9d. on the results. The latter show profits of £629,462 compared with £515,665, and, once again, the dividend is limited to 12½ per cent., a conservative payment which permits a further £100,000 to be added to reserves. This is a case where the shares are on a very small yield basis, because of the strong financial position and expectations that, as time goes on, pre-war dividend rates are likely to be regained. Borax Consolidated hardened to 43s. 3d. and General Refractories to 16s. 10½d., but Dunlop Rubber at 52s. lost an earlier rise. Wall Paper Manufacturers deferred moved up well to 43s. on hopes of better results for the current financial year.

There was selective buying of a number of shares connected with building, notably British Plaster Board at 34s. 3d., but Associated Cement receded to 59s. Iron and steels were firmer, more particularly shares of companies which have important export trade connections. Dorman Long firmed up to 25s. 10½d., Guest Keen to 40s. 7½d., Stewarts & Lloyds to 56s. 9d., and Tube Investments to £5⅝. International Paint receded 1s. 3d. to 125s., and Lewis Berger reacted sharply to 122s. 6d., the latter movement reflecting disappointment in the market that the dividend is unchanged at 19 per cent.; on the other hand, it was pointed out that actual earnings on the shares exceeded 47 per cent. and there is a strong balance-sheet position.

Among textiles, buyers were in evidence on any easing of prices. Bradford Dyers were 25s. 10½d., Bleachers 13s. 6d., and Calico Printers 20s. British Celanese remained active up to 34s. 6d., a position again attributed partly to American buying. Courtaulds eased to 55s. 9d. In other directions, Boots Drug were 56s. 3d., Sangers 30s. 6d., and Beechams 21s. 7½d. United Molasses at 43s. 3d. lost an earlier improvement and the units of the Distillers Co. were 118s. British Oxygen lost a little ground at 82s. 6d. Elsewhere, Barry & Staines were 53s. 3d., while Nairn & Greenwich were steady at 80s., results of the last-named company being due shortly. De La Rue were £10⅜, while British Industrial Plastics were 7s. 1½d., and British Glues & Chemicals active at 12s. 6d. Blythe Colour 4s. shares were close on 25s., B. Laporte 85s., British Drug Houses 48s. 6d., and Burt Boulton 27s.

Oil shares receded. Anglo-Iranian still being under the influence of the news from Persia. Exceptionally, Trinidad Leaseholds strengthened to 92s. 6d.xd. on the past year's results.

British Chemical Prices

Market Reports

TRADING conditions in the general chemicals market have been moderately active and inquiry has covered a fairly wide range of materials. The price position generally remains on a firm basis and deliveries against existing contracts are reported to be satisfactory. In the soda products section, acetate and nitrate of soda are a good market and a steady demand is reported for supplies of hyposulphite of soda. A moderate business is reported in Glauber salt and salt cake, and supplies of industrial refined nitrate of soda are quickly absorbed. A firm price position is reported from the potash section, with acid phosphate of potash in good demand. Steady inquiry is in circulation for both the pharmaceutical and technical grades of permanganate of potash, and supplies of bichromate of potash are being distributed to priority users. High prices are indicated for offers of yellow prussiate of potash and a steady demand is reported for acid phosphate of potash. In other directions glycerine is a good market and a fair trade is passing in white powdered arsenic. Supplies of peroxide of hydrogen are quickly taken up and alum lump is steady. In the coal-tar products section pitch has been fairly active for both home and export account and a steady demand has been reported for cresylic and carbolic acid. The pyridines are quiet and the xylols and toluols are moderate.

MANCHESTER.—Reasonably steady trading conditions have been reported in most sections of the Manchester chemical market during the past week and prices, for the most part, are fully maintained. Home industrial users are specifying for good deliveries of materials on order, and replacement business in the alkalis, mineral acids and a number of other products is coming through satisfactorily. Export inquiries have been on a fair scale. Moderately active conditions are being experienced in several sections of the fertiliser trade, though business is not likely to be generally brisk until after the turn of the year. There has been no lack of export buying interest in the tar products, some of which are also in fair request from home users.

GLASGOW.—Business in the Scottish heavy chemical trade during the past week has been more active on the home side. Prices remain firm. Export inquiries also have shown an improvement, with the shipping position becoming easier.

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